HT02-030

1. A planarizing process comprising:

providing a first layer of a material having an upper surface;

etching in said first layer a cavity having a floor;

forming on said cavity floor a copper coil, having at least 4 turns and a DC resistance that is less than about 2 ohms;

applying a layer of photoresist to a thickness that is more than sufficient to cover said lower coil;

hard baking said layer of photoresist and then planarizing so that between about 1 and 2.5 microns of remaining hard baked photoresist extends above said upper surface;

coating said layer of baked photoresist with a layer of alumina; and

planarizing by means of chemical mechanical polishing until said coil is just exposed and no photoresist remains on said upper surface.

2. The process recited in claim 1 wherein said cavity has a depth between about 2 and 4 microns.

3. The process recited in claim 1 wherein said cavity has a width between about 0.5 and 1 microns and a length between about 4 and 10 microns.

4. The process recited in claim 1 wherein the step of forming a copper coil further comprises:

depositing a conductive seed layer;

defining a location and shape for said coil by means of a photoresist pattern and then electroplating copper to a thickness between about 1.5 and 2.5 microns onto all areas not covered by said photoresist;

stripping away all photoresist; and

then removing all areas of the seed layer that are not covered by copper.

5. The process recited in claim 1 wherein the step of applying a layer of photoresist further comprises use of spin coating.

6. The process recited in claim 1 wherein the step of hard baking said layer of photoresist further comprises baking for 1 to 5 hours at a temperature between about 150 and 250 °C in vacuum or nitrogen.

7. The process recited in claim 1 wherein said layer of alumina is deposited to a thickness between about 5 and 6 microns.

8. The process recited in claim 1 wherein said layer of alumina is deposited by means of RF sputtering.

9. A process to manufacture a planar magnetic write head, having upper and lower

poles and an air bearing surface, comprising:

providing a lower magnetic shield layer;

forming a disc of dielectric material on said lower magnetic shield a layer;

forming, on said disc, a lower copper coil having at least 4 turns and a DC resistance that is less than about 2 ohms;

depositing and then patterning a first layer of ferromagnetic material to form a bottom section of the lower pole, having a top surface, that includes a centrally located lower trench on whose floor rest said dielectric disc and lower copper coil;

overfilling said lower trench with a first layer of insulating material and then planarizing so that said filled trench has an upper surface that is coplanar with the upper surface of said lower pole bottom section;

depositing, and then patterning, a second insulating layer to form a first lid that fully covers said lower coil and said lower trench;

forming, on said first lid, an upper copper coil, having at least 4 turns and a DC resistance that is less than about 2 ohms;

depositing and then patterning a second layer of ferromagnetic material thereby completing formation of the lower pole, including its top surface and a centrally located upper trench on whose floor rest said first lid and said upper copper coil;

depositing a layer of baked photoresist to a thickness that is sufficient to cover said upper coil and to extend at least 1 micron above the top surface of the lower pole;

then covering said layer of baked photoresist and all exposed portions of said lower pole with a layer of alumina;

then, by means of chemical mechanical polishing, planarizing until said upper copper coil and said lower pole are just exposed;

depositing, and then patterning, a third insulating layer to form a second lid that fully covers said upper coil and said upper trench;

depositing and then patterning a first layer of high permeability material on said lower pole;

then depositing and patterning a layer of non-magnetic material to coat said first layer of high permeability material only between said upper trench and said air bearing surface thereby forming a write gap;

depositing a second layer of high permeability material that contacts said write gap, said second lid, and said bottom pole; and

then forming a top pole on said second layer of high permeability material.

10. The process recited in claim 9 wherein said magnetic shield layer is a top shield of a magnetic read head.

11. The process recited in claim 9 wherein said bottom section of said lower pole is CoFe, CoNiFe, or NiFe.

12. The process recited in claim 9 wherein said bottom section of said lower pole is deposited to a thickness between about 1 and 1.5 microns.

13. The process recited in claim 9 wherein said first high permeability layer is CoFeN.

14. The process recited in claim 9 wherein said first high permeability layer is deposited to a thickness between about 0.15 and 0.4 microns.

15. The process recited in claim 9 wherein said lower trench has a depth between about 2 and 4 microns.

16. The process recited in claim 9 wherein said second high permeability layer is CoFeN.

17. The process recited in claim 9 wherein said second high permeability layer is deposited to a thickness between about 0.15 and 4 microns.

18. The process recited in claim 9 wherein said upper trench has a depth between about 2 and 4 microns.

19. The process recited in claim 9 wherein the step of forming said lower copper coil

further comprises:

depositing a conductive seed layer;

defining a location and shape for said coil by means of a photoresist pattern and then electroplating copper to a thickness between about 1.5 and 2.5 microns onto all areas not covered by said photoresist;

stripping away all photoresist; and

then removing all areas of the seed layer that are not covered by copper.

20. The process recited in claim 9 wherein said layer of alumina is deposited to a thickness between about 5 and 6 microns.

21. A planar magnetic write head, having an air bearing surface, comprising:

a lower magnetic shield layer;

a disc of dielectric material on said lower magnetic shield layer;

on said lower magnetic shield layer, a lower magnetic pole that surrounds said disc;

on said disc, a lower copper coil having at least 4 turns and a DC resistance that is less than about 2 ohms;

a first layer of insulating material that encapsulates said lower coil up as far as said coil's upper surface;

a second insulating layer in the form of a first lid that fully covers said lower coil and extends therefrom as far as said lower pole;

on said first lid, an upper copper coil having at least 3 turns and a DC resistance that is less than about 1.5 ohms;

a layer of baked photoresist that encapsulates said upper coil up as far as said coil's upper surface;

a third insulating layer in the form of a second lid that fully covers said upper coil and extends therefrom as far as said lower pole;

a first layer of high permeability material on said lower pole;

a layer of non-magnetic material coating said first layer of high permeability material only between said upper trench and said air bearing surface whereby it is a write gap;

a second layer of high permeability material that contacts said write gap, said second lid, and said bottom pole; and

a top pole on said second layer of high permeability material.

22. The write head described in claim 21 wherein said lower magnetic shield layer is a top shield of a magnetic read head.

23. The write head described in claim 21 wherein said bottom pole is CoFe, CoNiFe, or NiFe.

24. The write head described in claim 21 wherein said bottom pole has a thickness between about 1 and 1.5 microns.

25. The write head described in claim 21 wherein said high permeability layers are CoFeN.

26. The write head described in claim 21 wherein said first high permeability layer has a thickness between about 0.15 and 4 microns.

27. The write head described in claim 21 wherein first layer of insulating material is alumina.

28. The write head described in claim 21 wherein said second high permeability layer has a thickness between about 0.15 and 4 microns.

29. The write head described in claim 21 wherein said layer of non-magnetic material that forms the write gap is ruthenium or alumina.

30. The write head described in claim 21 wherein said layer of non-magnetic material that forms the write gap has a thickness between about 0.08 and 0.15 microns.